Observations on Plant Associations of the Psilidae (Diptera)

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The Psilidae are a small family of Acalypterate flies, whose identification is relatively easy, using the key by Collin (1944). Only one additional British species has been recorded since that date, by Wakerley (1959), bringing the total to 29. The phytophagous habit of the larvae has long been known as one of them (*Psila rosae* F.) is the Carrot Fly. Various authors have commented on plant associations of other species and these were summarised by Brindle (1965) who keyed the larvae of three species, representing the three genera. He was apparently unaware of the work of Osborne (1961) who compared the larvae and puparia of *P. rosae* and *P. nigricornis* Mg. as he stated that there were no published descriptions of the larvae of the latter.

While there is little doubt that all of the Psilidae are plant feeders, remarkably little is known even today of their biology, possibly because most of them develop in the less obvious parts of their food-plants and few feed on plants of economic importance. As I have observed probable plant associations of several species of Psilidae in recent years, it would perhaps be of interest to draw attention to some of these. The nomenclature used below follows Collin (*op. cit.*).

Chyliza species. Plant associations have been recorded for three of the five British species.

C. extenuata Rossi. A rather local fly which attacks Broomrapes (*Orobanche* species). I have reared it in two successive years from puparia in the bases of the previous year's dead stems of *Orobanche elatior* Sutton in chalk grassland at Leckford, Hants. (collected in iii.1973, emerging in early v.73; then in v.1974, emerging in early vi.74). Affected stems can be easily recognised as the base is markedly swollen below ground level, apparently due to gall formation induced by the presence of the larvae. They may be accompanied (usually higher up the stem) by the Agromyzid *Phytomyza orobanchia* Kalt., but when the latter only is present no swelling occurs. Previous records of *C. extenuata* are from *Orobanche rapum-genistae* Thuill.

C. vittata Mg. This species is usually stated to attack the roots of the Bird's Nest Orchid (*Neottia nidus-avis* L.), a record attributed by Séguy (1934) to Giard (1900). Brindle (*op. cit.*) quotes the description of the larva by vos de Wilde (1935). I have taken the fly in localities where *Neottia* is unlikely to occur so it may attack other Orchids or similar plants also.

C. leptogaster Pz. This is the commonest species of *Chyliza* in this country and may be found under tree foliage or walking

about slowly, flexing its wings on low vegetation, tree trunks, logs or stumps. I have not observed any regular plant association which might throw light on its life history. Collin (*op. cit.*) quoted the formation of stem-galls on *Physocarpus opulifolius* (L.) Maxim. (Rosaceae), a southern European plant but this may refer to some other species of *Chyliza* as the taxonomy of the genus was chaotic at the time the record was made.

Loxocera species appear to be specifically associated with Juncaceae. Brindle gave an account of de Meijere's (1947) description of the early stages of this genus, found in the base of the stems of *Juncus effusus* L. which may have included *L. albiseta* Schrank as well as *L. aristata* Pz. Both species are most commonly found in this country by sweeping stands of *Juncus*; *L. albiseta* is the commoner in southern England to Lancs. and Yorks. and occurs in southern Ireland from Wicklow to Kerry but apparently doesn't reach Scotland, while *L. aristata* is common throughout Scotland and Ireland but becomes local in south-east England. Whether or not they differ in their preferences for food-plants cannot yet be said.

L. sylvatica Mg. I have now on several occasions swept this species in numbers from pure stands of the wood-rush *Luzula sylvatica* (Huds.) Gaud. and believe that there is a specific association with this plant. It has occurred on the plant at three Irish localities (Ennistymon, Co. Clare and Glendalough, Co. Wicklow, both late v.1970; Glen of the Downs, Co. Wicklow, 11.vii.1969) and three Scottish localities (Cramond Bridge, West Lothian; Den of Alyth, Perthshire and Feshie Bridge, Inverness, all late v.1973); then on 18.v.1974 a party, including Mr. A. E. Stubbs, Mr. E. G. Philp and myself, found a small colony of the fly localised to *L. sylvatica* along the margin of Farningham Wood, Kent, possibly the first record of the fly from south-east England.

Psila (*Camptopsila*) *lefebvrei* Zett. This fly is frequent in Scotland and the north of England but does not apparently reach the south-east. On 6.viii.1972 I collected several on Foxgloves (*Digitalis purpurea* L.) in the Glen More National Forest Park, Inverness, amongst sparse vegetation on a mountain stream. An association with a rush or sedge in the vicinity cannot, of course, be ruled out.

P. (*Pelethophila*) *fimetaria* L. Brindle (*op. cit.*) states that this species, the largest British Psilid (8-9 mm. long) is recorded from *Carex*, without citing the source of the record. The fly is usually found amongst low vegetation in marshy woods where several *Carex* species commonly occur so such an association is not impossible and worthy of investigation. How little is known of the Dipterous fauna of Cyperaceae is shown by recent work on the North American Scatophagidae as it has been established that all species of *Cordilura* develop in the leaf-sheaths of *Carex* species, while nothing has been known of the biology of European *Cordilura*. One species of *Cordilura* has now been reared from *Carex* in this country by Mr. A. E. Stubbs and myself and an account of this will be published

by him at a later date. *P.* (*P.*) *merdaria* Collin is a very similar fly to *P. fimetaria* and will probably be found to have a similar life-history.

P. (*Psila*) species. Although there are 15 British species of this sub-genus little is known of the habits of any species other than *P. rosae* and *P. nigricornis* mentioned above. Collin suggests that *P. nigricornis* as well as *P. rosae* was associated with Umbelliferae, saying both were present in cages erected on fields of carrots; Brindle, however, refers to records of *nigricornis* from the roots of cultivated Chrysanthemums, originally published by Kearns & Walton (1933) and by Osborne (1961). Several of the other species of *Psila* (*sensu stricto*) appear to be attracted to Umbelliferae or Compositae, but there is no definite evidence that any one species affects both families of plants equally. *P. rosae,* however, attacks cultivated *Brassica* species (Cruciferae) in addition to its usual Umbelliferous hosts. As Brindle noted, *P. rosae* develops not only in the roots of the cultivated species of *Daucus, Pastinaca* and *Apium* but also the wild *Anthriscus* and *Heracleum*; Collin recorded it from Hemlock (*Conium*).

P. pallida Fall. I have found this species on the foliage of Hogweed (*Heracleum sphondylium* L.) both at Leckford, Hants. and at Castletown, Caithness (numerous on the latter occasion) and an association is probable. I did also, however, take one female on Burdock (*Arctium*) at Bromley, Kent, so this species might possibly attack both Umbelliferae and Compositae.

P. bicolor Mg. An association with Tansy (*Tanacetum* or *Chrysanthemum vulgare* L.) was recorded on two occasions by Haliday, first from Roundstone Bay, Galway, abundantly in early August exclusively on this plant (Haliday, 1837), then again at Great Blasquet Island, Kerry, July 1854 (Hogan & Haliday, 1855). There are no specimens of *bicolor* in Haliday's collection and the possibility that the records refer to one of the similar bicoloured species cannot be discounted, but Osborne (1955, 1961) recorded both *bicolor* and *P. limbatella* Zett. from cultivated Chrysanthemums. I have only once collected *P. bicolor,* at Bromley, Kent on 16th August 1964, where the single female was walking about on the foliage of White Bryony overhanging a vigorous plant of Mugwort (*Artemisia vulgaris* L.). Being nearly related to *Chrysanthemum* and *Tanacetum,* the latter is a possible food-plant, but it is a common plant on waste ground and one might expect a fly feeding on it to be more frequent.

P. nigromaculata Strobl. Brindle noted the record of the rearing of this species from the stems of the Devil's Bit Scabious (*Succisa pratensis* Moench), originally published by Séguy. It is not often collected in Britain but should perhaps be looked for on its food-plant. It appears to be commoner in Ireland, where all records of the *P. bicolor* group (some published under the name of *P. debilis* Egger) for which specimens exist, refer to this species. *Succisa* is of general distribution there while *Tanacetum* is now more restricted there than it is in Britain.

P. humeralis Zett. Collin stated that this species is not uncommon in the Spey Valley in June. I have found it in June this year (1974) to occur more widely in Scotland, at localities in Perthshire and Aberdeenshire as well as in Inverness. At Granish, Inverness, in August 1972 I found it on *Heracleum* but at Glenfincastle, Perthshire, vi.1974, it was abundant on Sweet Cicely (*Myrrhis odorata* (L.) Scop.), so an association with various Umbelliferae may again be possible in this species.

Psila nigra Fall. and *P. atra* Mg. are both locally frequent in marshy grasslands, but these small black species are usually collected by sweeping and the variety of vegetation in localities where I have collected them has precluded any useful observations on plant associations.

A note on the *Psila rosae* group

With respect to *P. rosae* and its relatives, there are three species in this country, distinguishable by the structure of the male genitalia. The hypopygia are figured for *rosae* and *nigricornis* by Collin; Wakerley figured his new species *persimilis* and the aedeagus of these three and of *humeralis,* because *persimilis* was found by him to vary in colour so that some specimens approach that species. Lyneborg (1964) figured the entire hypopygium of the three species of this group.

I have dissected the 18 males in my collection, which agreed in body colour with *rosae*. Of these, 14 were *P. rosae,* only four which were of a weak-bodied almost teneral appearance by comparison with the other 14 belonged to the other species. One from Chislehurst, Kent was *P. nigricornis* while two from Ireland (Dunamarc Falls, Cork, 14.x.73 and Muckross, Kerry, 2.vii.69) and one from the French Pyrenees (Ussat-les-Bains, Ariège, 26.v.71) belonged to *P. persimilis*. I quote these records as I am not aware of records of *persimilis* other than those published by Wakerley from Northumberland and Durham and Lyneborg (*op. cit.*) from Denmark. It is possible that I have selected more *rosae* than *nigricornis* from my net, if it is usually a more robust species, as Collin found *nigricornis* to be commoner at times.

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Interspecific Competition and the History of *Pieris rapae* in North America

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Workers on a particular group of organisms often engage in discussions of quite general phenomena while maintaining a rigid parochialism. The recent discussion of interspecific competition in butterflies between Messrs. Sevastopoulo (1973), *Ent. Rec.*, **85**: 247) and Luckens (1974, *Ent. Rec.*, **86**: 71-72) is a case in point; although Luckens refers to competition as a recognised concept "in all fields of zoology", both by and large act as though butterflies were likely to be unique among living things in their competitive relationships (or lack of them). Yet interspecific competition has engaged the attention of both field and theoretical ecologists and has been studied in vertebrates, invertebrates, plants and microorganisms, and the literature of the subject is immense! A commonly held view among American ecologists is that interspecific competition is a very important organising force in biotic communities, acting on at least two levels: firstly, in cases where niche overlap is initially very great, by direct exclusion in ecological time; secondly, promoting divergence of the niches of partial competitors through natural selection in evolutionary time. Opponents of the concept of interspecific competition often point to the seeming rarity of documented instances in nature; its supporters observe that by their view episodes of competition are transient, leading to exclusion or ecological divergence, so that in most cases organisms in stable communities will already have divided up their resources before we ever get a look at them.